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(71) Applicant(s)
Bespak Plc
(Incorporated in the United Kingdom)
Bergen Way, North Lynn Industrial Estate,
KING'S LYNN, Norfolk, PE30 2JJ, United Kingdom

(72) Inventor(s)
Anthony Stanford

(74) Agent and/or Address for Service
Boult Wade Tennant
Verulam Gardens, 70 Gray's Inn Road, LONDON,
WC1X 8BT, United Kingdom

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F1R RCD R102

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GB 2209514 A

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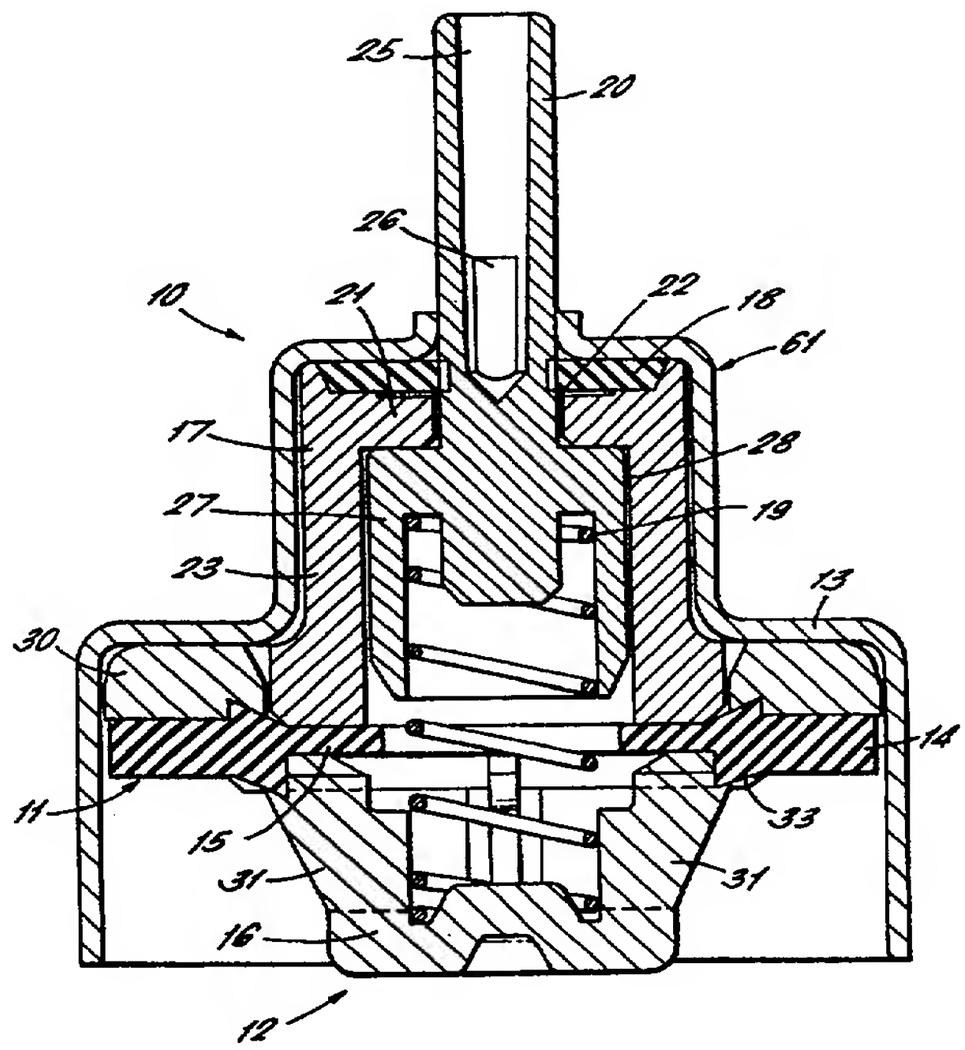
UK CL (Edition R) **B8N NKB NM , F1R RCD , F2V VR2**
INT CL[7] **B65D 83/14**
Online: EPODOC, PAJ, WPI

(54) Abstract Title
Metering valve with integrally formed seal

(57) A metering valve 10 is provided with an inner seal 15, an outer seal 18 or a gasket 14 integrally formed with a part of the valve body 16, 17. This avoids problems with the seal being displaced during assembly of the valve. The valve body may comprise an inner 16 and an outer 17 member, and the inner seal 15 may be integrally formed with either the inner 16 or the outer 17 member, and the outer seal 18 may be formed integrally with the outer member 17. Also, the gasket 14 which is located on the valve body for sealing against a neck portion of a pressurised dispensing container 13, may be integrally formed with the inner member 16, or with the inner seal 15. The integrally formed components are preferably co-mouldings, which are formed by injection moulding a first material to form the part of the valve body and then injection moulding a second material to form the seal on the valve body part.

FIG.1.



At least one drawing originally filed was informal and the print reproduced here is taken from a later filed formal copy.

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FIG. 1.

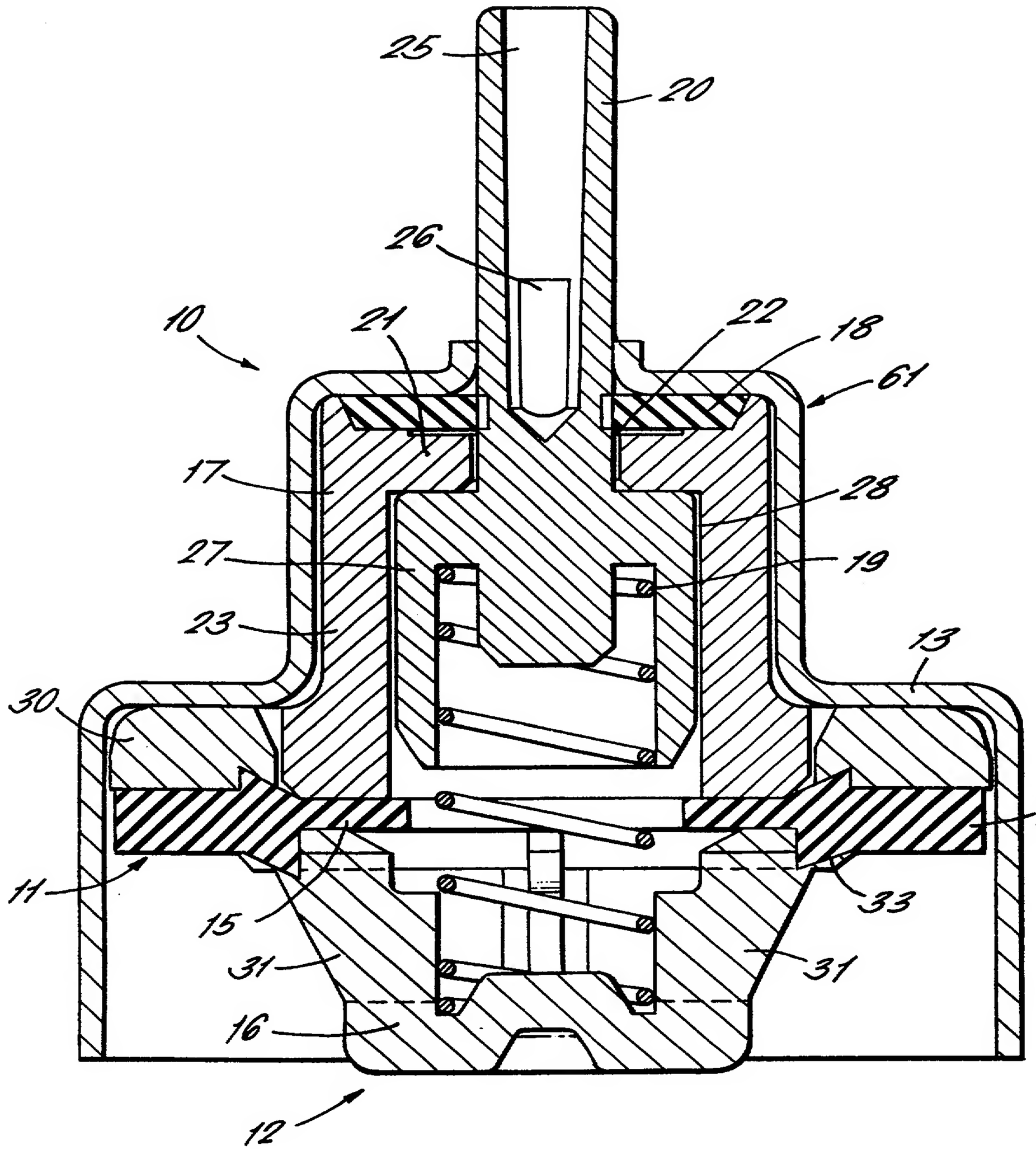


FIG. 2a.

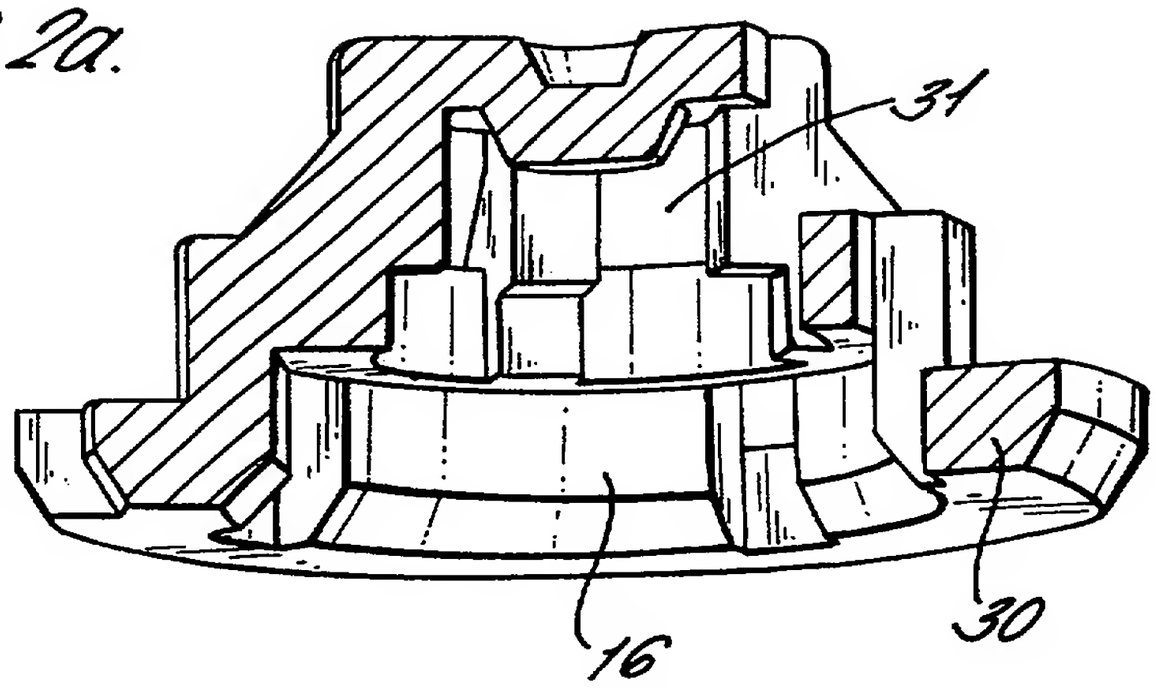


FIG. 2b.

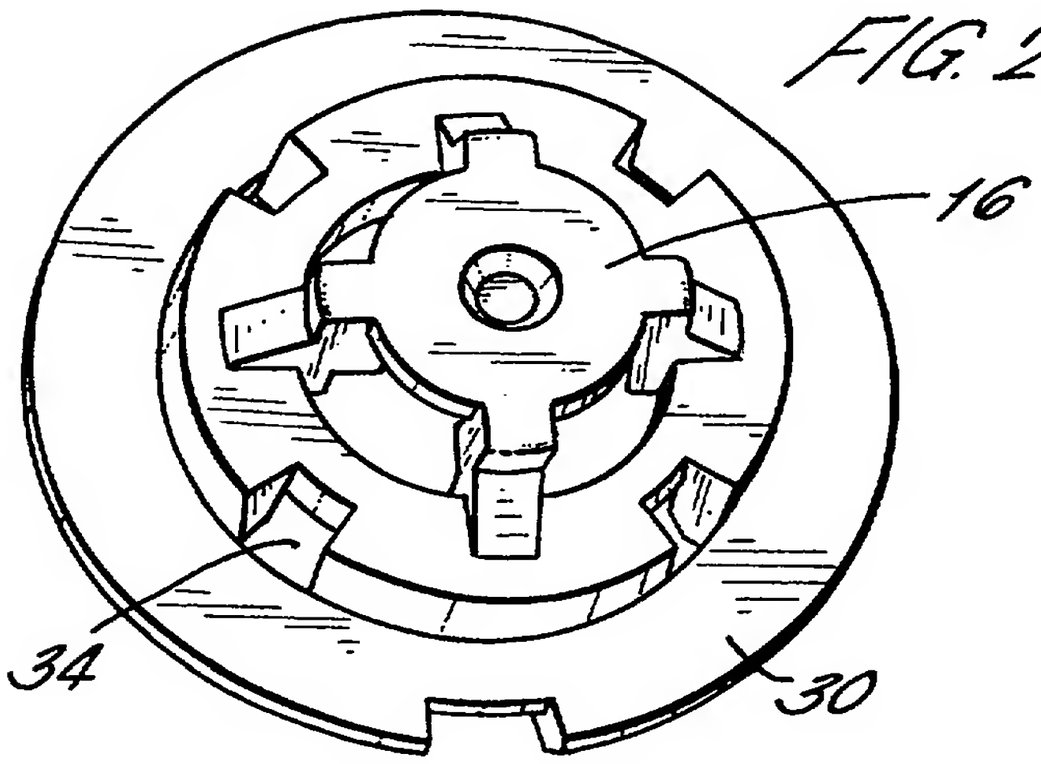


FIG. 3.

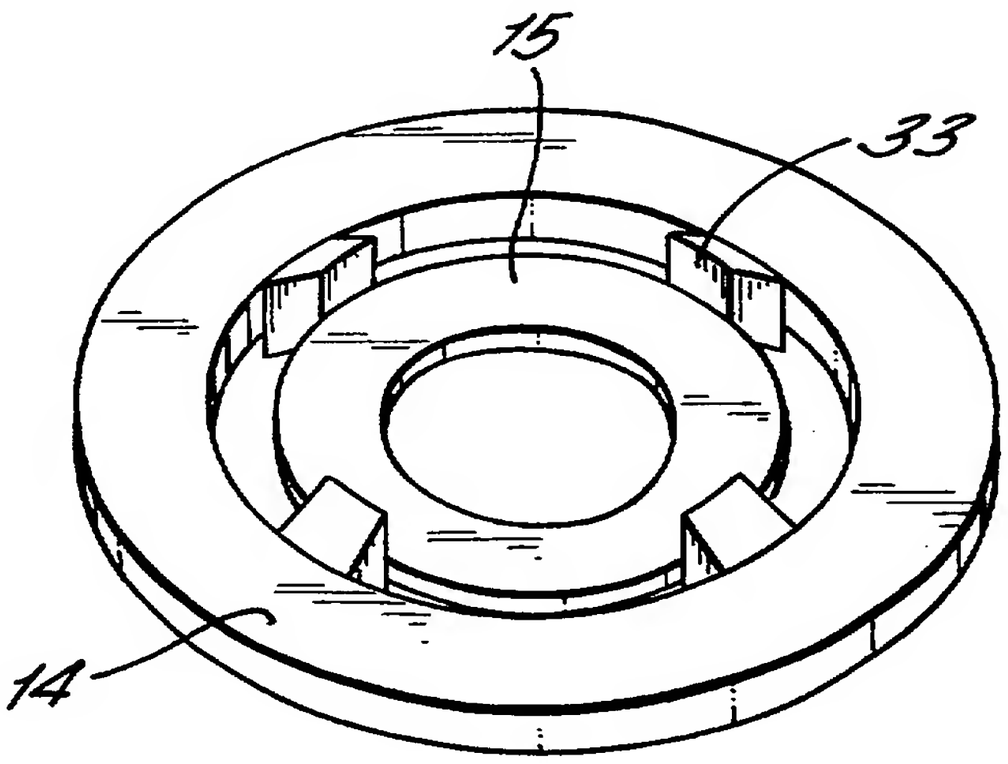


FIG. 4a.

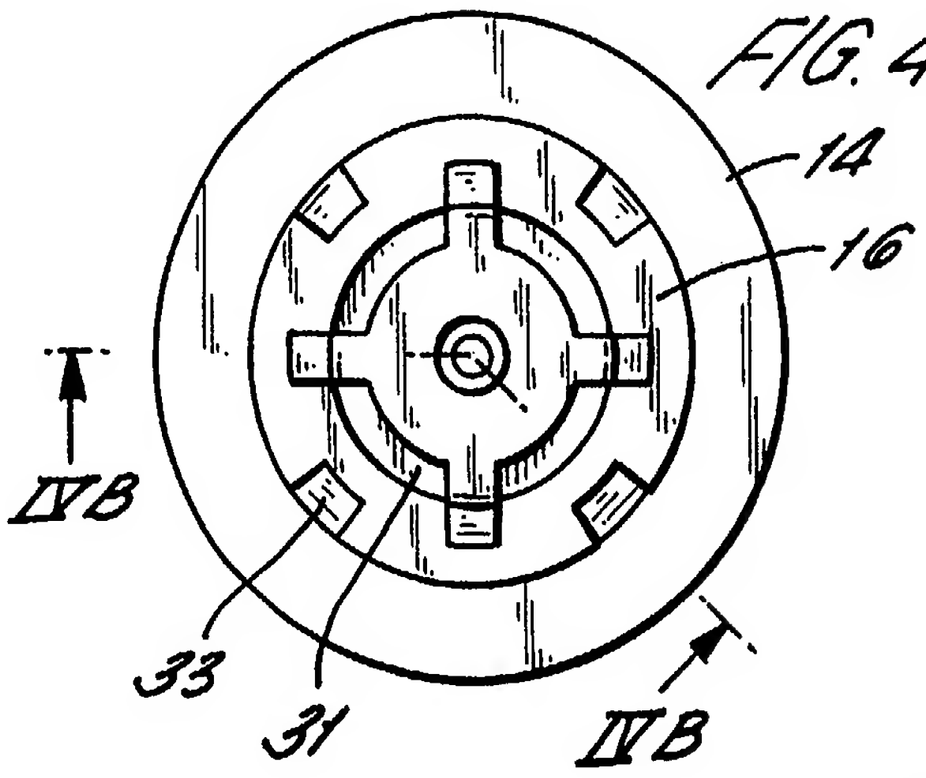


FIG. 4b.

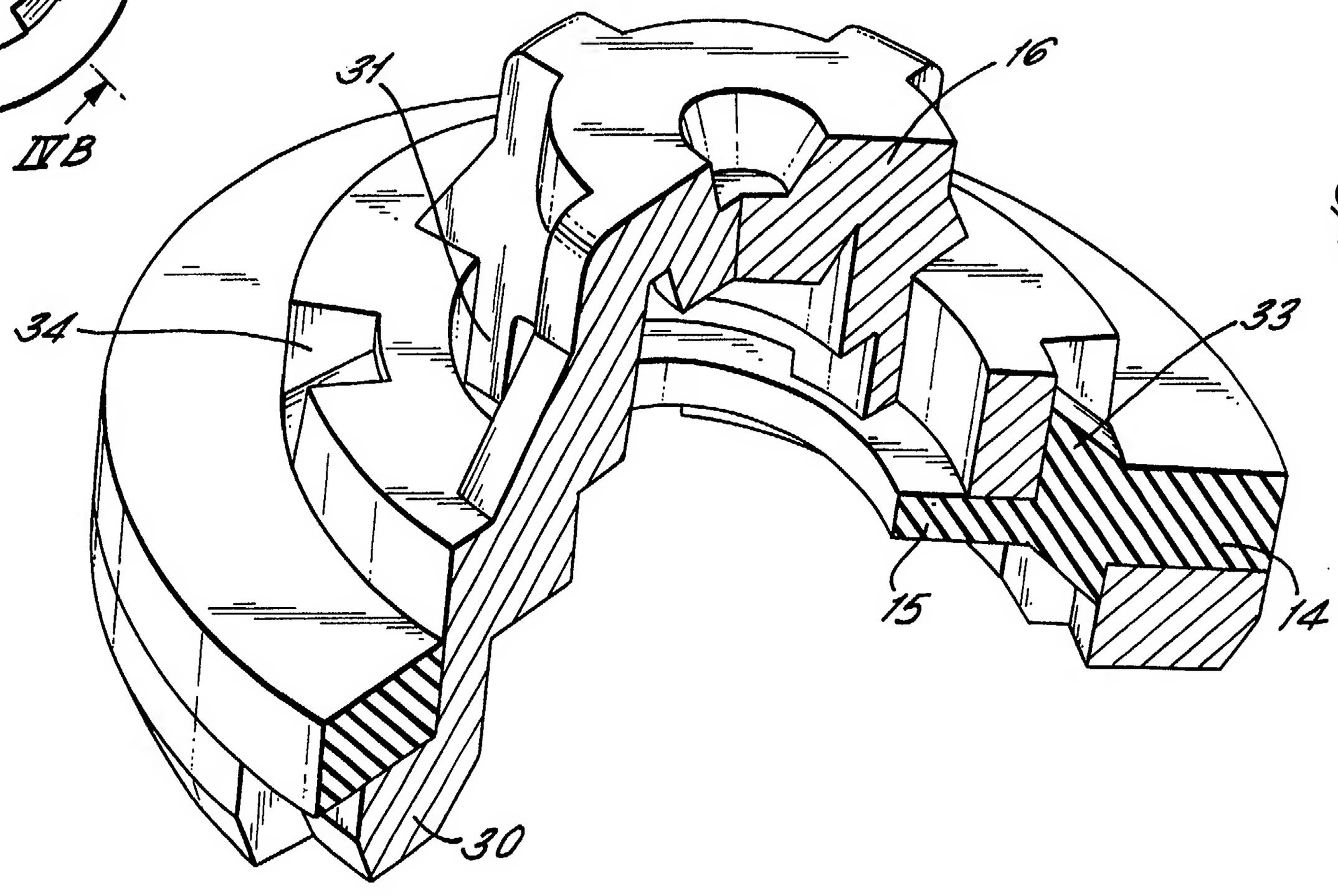


FIG. 5a.

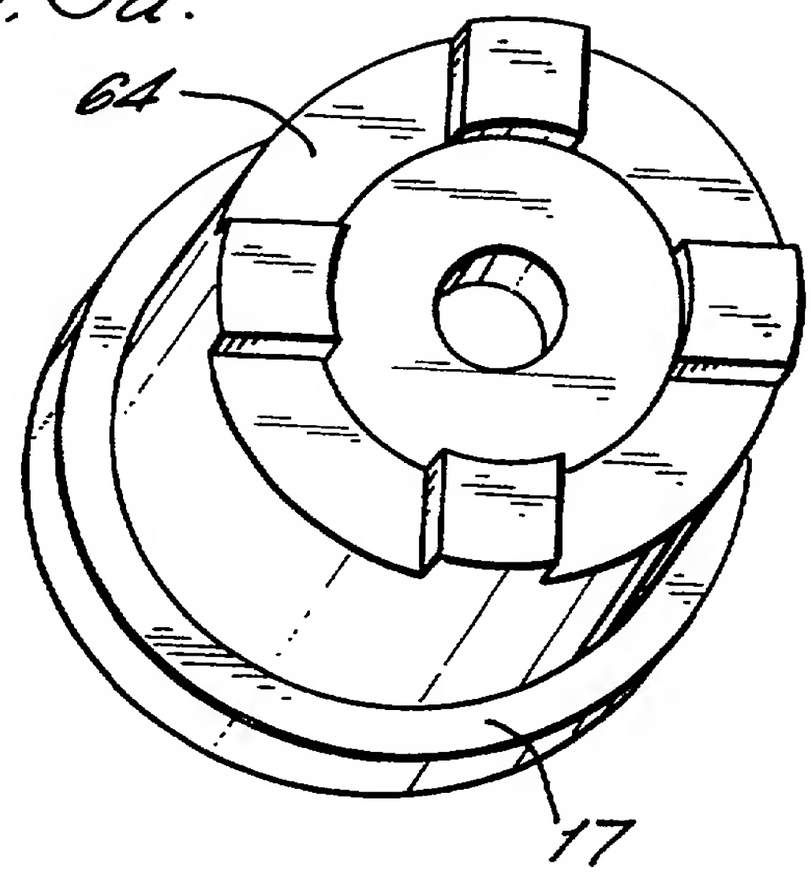


FIG. 5b.

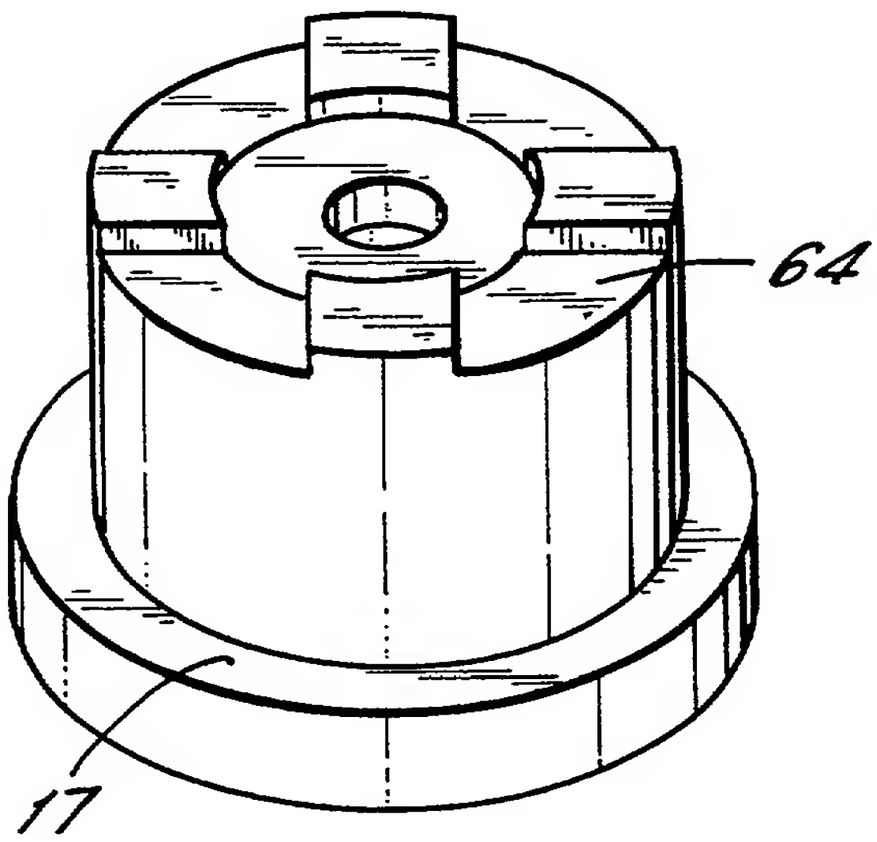


FIG. 6.

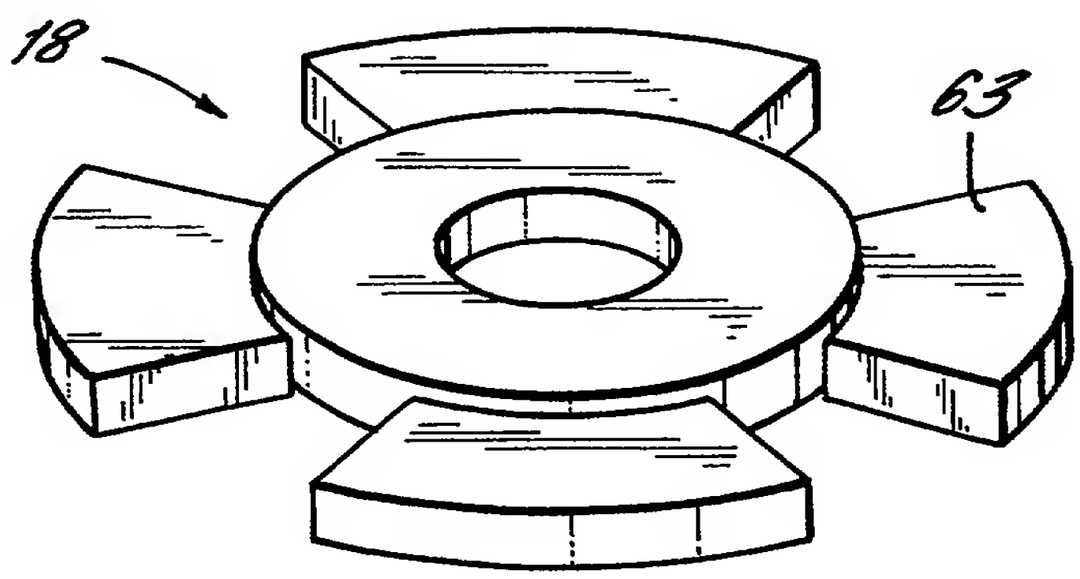


FIG. 7a.

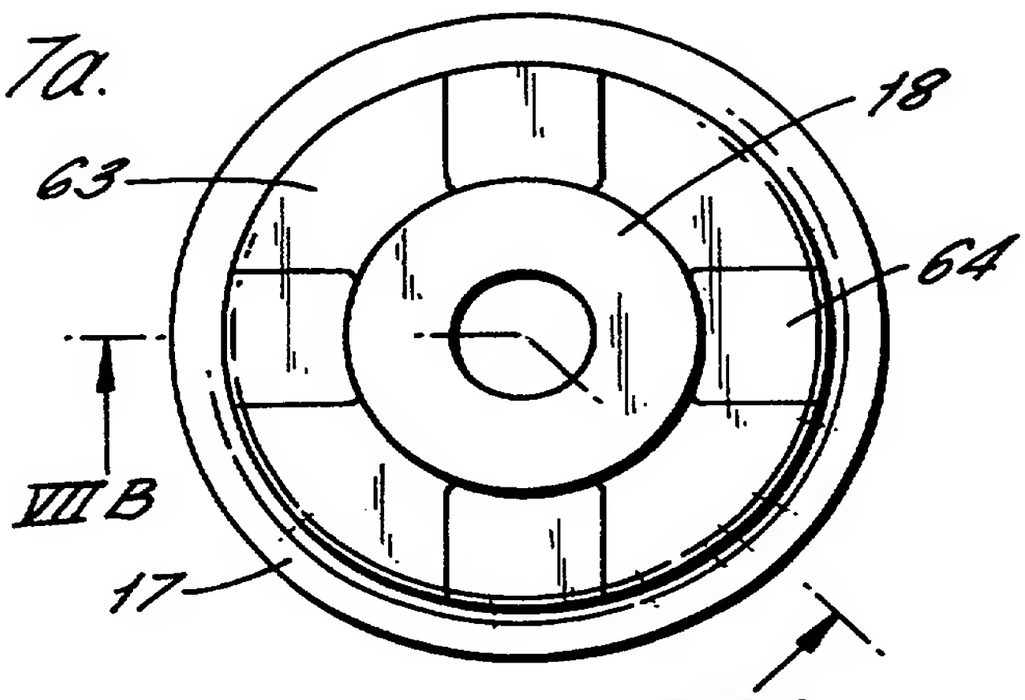
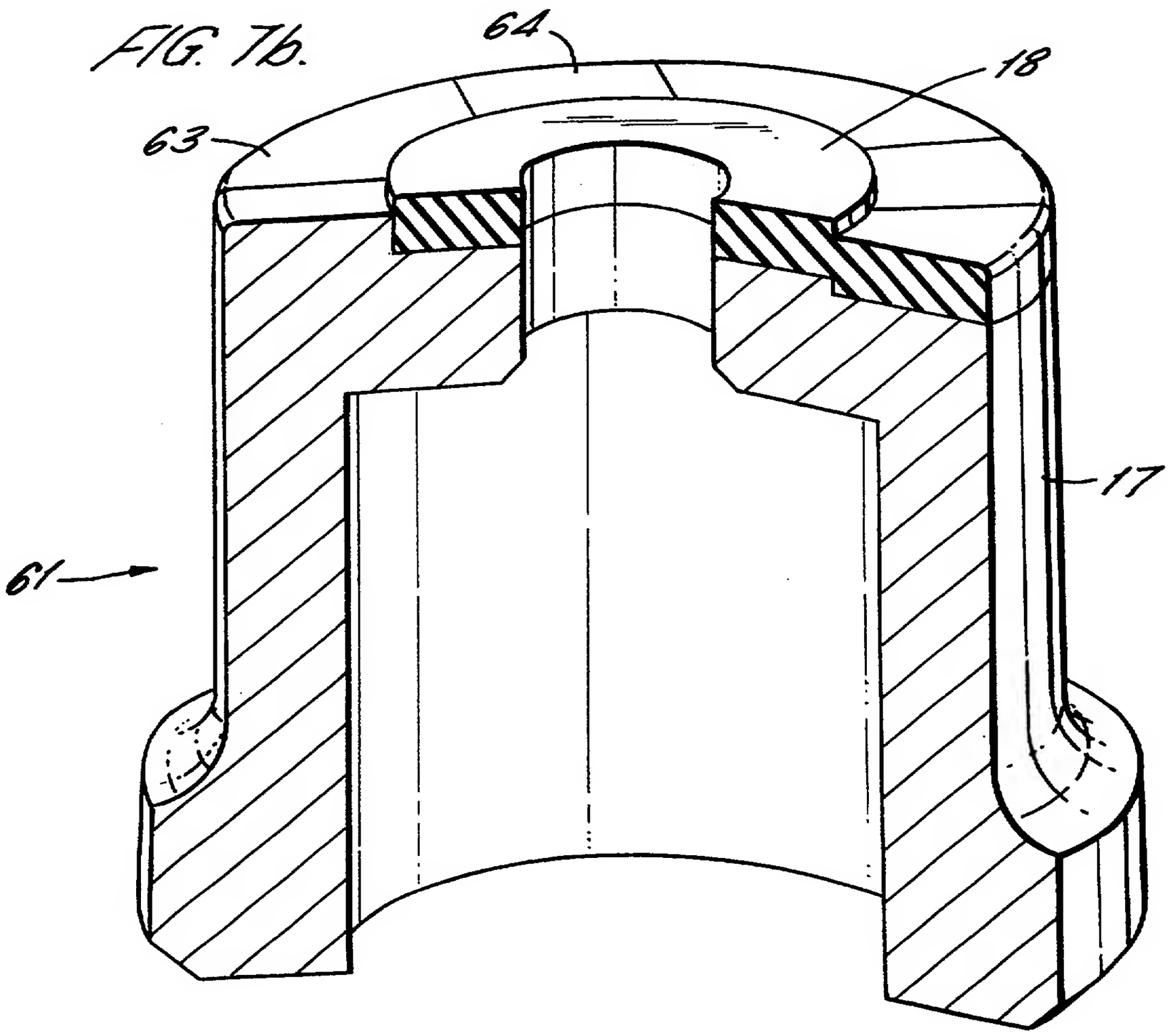


FIG. 7b.



Improvements in or Relating to Valves for Dispensers

The invention relates to improvements in metering valves for use in dispensing apparatus.

Dispensing apparatus, for dispensing metered doses of product, generally comprise a valve attached to a dispensing container in which the product to be dispensed is stored. The valve is held in position relative to the dispensing container by means of a cap or ferrule which is crimped to an open neck of the container.

In metered dose valves, a metering chamber is provided sealed at respective inner and outer ends by inner and outer seals. The outer seal prevents leakage of product between the metering chamber and atmosphere when the apparatus is in a non-dispensing position. The inner seal prevents leakage of product between the container and the metering chamber when the dispensing apparatus is in an operative, dispensing position. In addition in order to provide an adequate seal to prevent loss of the stored product, an elastomeric sealing gasket is provided between the cap or ferrule and container.

Assembly of the inner and outer seals and the elastomeric gasket with the remainder of the components of the metering valve requires a number of assembly steps which can be time consuming and difficult to achieve, in part due to the small size of the components. In particular, the assembly of the inner seal and the elastomeric gasket with the valve body of the metering valve firstly requires inner and outer members of the valve body to be assembled, sandwiching the inner seal between the inner and outer members. Up until this point in the assembly process, the inner seal is held in position relative to the valve body only by frictional forces set up between the inner seal and the inner member of the valve body.

A problem found with this arrangement is that during manipulation of the inner member in preparation for assembly with the outer member the inner seal may potentially be displaced from its correct position.

The elastomeric gasket is then push-fitted onto the valve body.

The outer seal is assembled with the outer member and the cap or ferrule is then placed over the valve stem to retain the outer seal on the valve body. A problem found with this arrangement is that during manipulation of the valve body in preparation for assembly with the cap or ferrule the outer seal may potentially be displaced from its correct position.

The metering valve is then attached to a dispensing container by crimping the cap or ferrule over the open end of the dispensing container such that the neck portion of the container engages the elastomeric gasket. Up until this point in the assembly process, the elastomeric gasket is retained on the valve body only by frictional forces set up between the elastomeric gasket and the inner member. A problem with this arrangement is that during manipulation of the inner member during assembly with the outer member, and during manipulation of the assembled valve body during assembly with the dispensing container, the elastomeric gasket may potentially be dislodged from its correct position on the valve body.

According to the present invention there is provided a metering valve for assembly with a pressurised dispensing container, the valve comprising a valve stem co-axially slidable within a valve body defining a metering chamber, inner and outer seals for sealing between the valve body and the valve stem, and a gasket located on the valve body for sealing against a neck portion of a pressurised dispensing container, wherein at least one of inner seal, outer seal or

gasket is formed as a unitary component with at least a part of the valve body.

There is also provided a co-moulding for use in a metering valve comprising at least a part of a valve body, inner seal and gasket formed as a unitary component.

There is also provided a co-moulding for use in a metering chamber comprising at least a part of a valve body and a seal formed as a unitary component.

The present invention also discloses a metering valve for assembly with a pressurised dispensing container, the valve comprising a valve stem co-axially slidable within a valve body defining a metering chamber, inner and outer seals for sealing between the valve body and the valve stem, and a gasket located on the valve body for sealing against a neck portion of a pressurised dispensing container, wherein the inner seal and gasket are formed as a unitary component.

The present invention also discloses a method of manufacturing a co-moulding for use in a metering valve comprising the steps of forming a first mould shape, injection moulding a first material to form a part of a valve body, forming a second mould shape containing the part of the valve body, and injection moulding a different material to form at least one sealing element in intimate relationship with the part of the valve body.

Embodiments of the present invention will now be described, by way of example only, with reference to the accompanying drawings in which:

Figure 1 shows a cross-sectional side elevation of a metering valve according to the present invention;

Figure 2a shows a perspective view of a sectioned

inner member of a valve body of the metering valve of Figure 1;

Figure 2b shows a perspective view of the inner member of Figure 2a from a different angle;

Figure 3 shows a perspective view of a sealing gasket and inner seal of the metering valve of Figure 1;

Figure 4a shows a plan view of the inner member of Figure 2a moulded with the sealing gasket and inner seal of Figure 3;

Figure 4b shows a perspective view of the arrangement of Figure 4a sectioned on line IVB-IVB of Figure 4a;

Figure 5a shows a perspective view of a sectioned outer member of the valve body of the metering valve of Figure 1;

Figure 5b shows a perspective view of the outer member of Figure 5a from a different angle;

Figure 6 shows a perspective view of an outer seal of the metering valve of Figure 1;

Figure 7a shows a plan view of the outer member of Figure 5a moulded with the outer seal of Figure 6; and

Figure 7b shows a perspective view of the arrangement of Figure 7a sectioned on line VIIB-VIIB of Figure 7a.

The metering valve 10 of the present invention, as shown in Figure 1, is connectable in use to a dispensing container (not shown) in which a product to be dispensed in metered doses is stored. The product may, for example, be a liquid or a drug substance held in suspension or in solution and expelled using a volatile liquified propellant such as a CFC or an HFA or blends thereof.

The valve 10 is held in position to seal the dispensing container by a cap or ferrule 13 which is

crimped to the open neck of the container.

The valve 10 comprises a valve stem 20 which extends coaxially within a generally cup-shaped outer member 17 so as to be externally accessible.

In the following description and claims the term "inner" is used to mean being relatively remote from a dispensing end of valve stem 20. The term "outer" is used to mean being relatively proximate a dispensing end of valve stem 20.

The valve 10 further comprises an inner member 16, a gasket 14, an inner seal 15 and an outer seal 18.

The inner member 16 and outer member 17 together define a valve body 12.

The outer member 17, preferably of a polymeric material, has at an outer end a base 21, in which is located an aperture 22, and side walls 23 defining an open end to the outer member 17. Sandwiched between the base 21 of the outer member 17 and the ferrule 13 is the outer sliding seal 18 of an elastomeric material which also has an aperture therein.

The valve stem 20, preferably of a polymeric or metallic material, has at one end a generally hollow section 25 defining a dispensing channel in which portion 25 is located a port 26, and at its other end a piston 27 having a larger cross-sectional area than the hollow section 25. The hollow section 25 extends from the container and the piston 27 is received in and is slidable relative to the outer member 17. The external diameter of the piston 27 is selected to be smaller than the internal diameter of the outer member 17 thus leaving a radial clearance 28.

The inner member 16 covers off the open end of the outer member 17 and is secured in position by a flange portion 30 which is clamped between the ferrule 13 and the gasket 14 when the valve 10 is assembled with the dispensing container. The inner member 16

has entry ports 31 to allow the liquified product to access the inside of the valve 12.

A return spring 19, preferably of stainless steel, is located between a base of the inner member 16 and the piston 27 thereby urging the piston 27 into contact with the base 21 of the outer member 17.

In known metering valves the inner member, outer member, gasket, inner seal and outer seal are provided as separate components which must be assembled with one another during assembly of the metering valve 10.

According to the present invention a co-moulded inner member, generally referenced in the accompanying Figures by numeral 11, and a co-moulded outer member, generally referenced in the accompanying drawings by numeral 61, are provided.

The co-moulded inner member 11 and co-moulded outer member 61 together define a valve body 12.

The co-moulded inner member 11 comprises an inner member 16, inner seal 15 and gasket 14 formed as a single unitary component by means of a co-moulding manufacturing process. The co-moulded outer member 61 comprises an outer member 17 and an outer seal 18 formed as a single unitary component by means of a co-moulding manufacturing process.

The co-moulded inner member 11 is formed using two moulding steps. A first mould shape is formed by a mould tool and a first material is injection moulded into the mould shape to form the core component of the inner member 16 as shown in Figures 2a and 2b. A second mould shape is then formed which contains the core component. Preferably the same mould tool is used to form the first and second mould shapes by means of actively controlled components of the mould tool which may be moved relative to one another to vary the configuration of the mould shape and to provide the necessary flow paths for the injection process.

A second material is then injected into the second mould shape to form the inner seal 15 and gasket 14. Since the core component of the inner member 16 is present in the second mould shape the inner seal 15 and gasket 14 are intimately moulded with the inner member 16 such that a strong mechanical bond is achieved between the inner seal 14, gasket 15 and inner member 16 as shown in Figures 4a and 4b.

The form of the gasket 14 and inner seal 15 is shown in Figure 3 and the form of the finished co-moulded valve body 11 is shown in Figures 4a and 4b. The gasket 14 and inner seal 15 are provided with keyed portions 33 which matingly engage with keyways 34 in the inner member 16. The keyed portions 33 and keyways 34 improve the mechanical bonding between the inner member 16 and the gasket 14 and inner seal 15.

Similarly, the co-moulded outer member 61 is formed using two moulding steps. A first mould shape is formed by a mould tool and a first material is injection moulded into the mould shape to form the core component of the outer member 17 as shown in Figures 5a and 5b. A second mould shape is then formed which contains the core component. Preferably the same mould tool is used to form the first and second mould shapes by means of actively controlled components of the mould tool which may be moved relative to one another to vary the configuration of the mould shape and to provide the necessary flow paths for the injection process.

A second material is then injected into the second mould shape to form the outer seal 18. Since the core component of the outer member 17 is present in the second mould shape the outer seal 18 is intimately moulded with the outer member 17 such that a strong mechanical bond is achieved between the outer seal 18 and outer member 17 as shown in Figures 7a and 7b.

The form of the outer seal 18 is shown in Figure 6 and the form of the finished co-moulded outer member 61 is shown in Figures 7a and 7b. The outer seal 18 is provided with keyed portions 63 which matingly engage with keyways 64 in the outer member 17. The keyed portions 63 and keyways 64 improve the mechanical bonding between the outer member 17 and the outer seal 18.

An advantage of this method of forming the co-moulded inner member 11 and co-moulded outer member 61 is that a first material may be used to form the inner member 16 and outer member 17 and a different material used to form the sealing elements, namely the gasket 14, inner seal 15 and outer seal 18. Thus the optimum material for each portion of the metering valve 10 may be utilised. A further advantage is that the finished co-moulded inner 11 and co-moulded outer member 61 are single unitary components wherein there is no risk of the gasket 14, inner seal 15 and outer seal 18 becoming detached during manipulation and assembly with the remainder of the metering valve 10. Thus, the ease of assembly of the metering valve is much improved and the number of assembly steps required in assembling the metering valve is significantly reduced. This has consequential time and cost savings.

The inner member 16 and outer member 17 may be formed, by way of example only, from any of:

acetal;
nylon; and
polyester.

The outer member 17 and inner member 16 may be formed from different materials.

The gasket 14, inner seal 15 and outer seal 18 may be formed by way of example only, from any of:

polyurethane (aromatic polyether or aromatic polyester);
thermoplastic vulcanizates (being a blend of a plastic part selected from polypropylene, polyethylene or polystyrene and a crosslinked elastomer selected from polyisprene, polybutadiene, polyethylene propylene, polychloroprene, polyacrylonitrile butadiene, polyisobutyl or other crosslinkable elastomers);
polystyrene polyethylenebutylene block copolymers;
polystyrene polybutadiene block copolymers;
thermoplastic polyolefin (such as ethlyene propylene rubber);
co polyether ester;
polyether block amides; and
polyethylene copolymers.

The outer seal 18 may be formed from a different material compared to the inner seal 15 and gasket 14.

In use, the valve stem 20 of the metering valve 10 is displaced axially relative to the remainder of the valve 10 against the bias of spring 19. As this occurs, a temporary chamber is created between the valve stem 20 and the outer member 17. Product flows through the radial clearance 28 between the piston 27 and the outer member 17 and flows into the chamber until a lower edge of the piston 27 contacts the inner seal 15 of the co-moulded inner member 11. A liquid-tight seal is created at that point of contact which prevents further ingress of product. The metered dose of product to be dispensed is defined by the volume of the chamber and the clearance 28. Further depression of the valve stem 20 causes the port 26 in the hollow section 25 of the valve stem 20 to pass through the outer seal 18 and into the chamber. The preferred propellant systems are liquified gases or combinations

thereof having boiling temperatures significantly below room temperature. As a result, the product boils evacuating the contents of the chamber through the port 26 into the dispensing channel in the hollow section 25 of the valve stem 20 thus providing an exit path for the product.

Release of the valve stem 20 allows the spring 19 to recover thereby forcing the valve stem 20 to return to its rest position and the metering chamber disappears as the piston 27 approaches the base 21 of outer member 17.

In another embodiment the inner seal 15, outer member 17 and outer seal 18 may be formed as a single unitary component by means of a co-moulding.

Whilst the co-moulded inner member 11 and co-moulded outer member 61 have been described in the above embodiment for use in a metering valve having a temporary metering chamber, it should be appreciated that the co-moulded inner member 11 and co-moulded outer member 61 are also suitable for use in metering valves in general, for example those having permanent metering chambers.

Claims:

1. A metering valve for assembly with a pressurised dispensing container, the valve comprising a valve stem co-axially slidable within a valve body defining a metering chamber, inner and outer seals for sealing between the valve body and the valve stem, and a gasket located on the valve body for sealing against a neck portion of a pressurised dispensing container, wherein at least one of inner seal, outer seal or gasket is formed as a unitary component with at least a part of the valve body.

2. A metering valve as claimed in claim 1 wherein the valve body comprises inner and outer members.

3. A metering valve as claimed in claim 2 wherein the inner seal is formed as a unitary component with the inner member.

4. A metering valve as claimed in claim 2 wherein the inner seal is formed as a unitary component with the outer member.

5. A metering valve as claimed in either claim 3 or claim 4 wherein the outer seal is formed as a unitary component with the outer member.

6. A metering valve as claimed in any of claims 2 to 5 wherein the gasket is formed as a unitary component with the inner member.

7. A metering valve as claimed in any of claims 2, 3, 5 or 6 wherein the inner seal is formed as a unitary component with the gasket.

8. A metering valve as claimed in claim 7 wherein the inner seal, gasket and inner member are formed as a unitary component.

9. A metering valve as claimed in any of claims 2 to 8 wherein the inner member is a made of a first material and the inner seal and gasket are formed of a different material.

10. A metering valve as claimed in any of claims 2 to 9 wherein the outer member is a made of a first material and the outer seal is formed of a different material.

11. A metering valve as claimed in claim 9 or claim 10 wherein the first material is selected from acetal, nylon and polyester.

12. A metering valve as claimed in any of claims 9 to 11 wherein the different material is selected from polyurethane, thermoplastic vulcanizates, polystyrene polyethylenebutylene block copolymers, polystyrene polybutadiene block copolymers, thermoplastic polyolefin, co polyether ester, polyether block amides and polyethylene copolymers.

13. A metering valve as claimed in any preceding claim wherein the unitary component is a co-moulding.

14. A co-moulding for use in a metering valve comprising at least a part of a valve body, inner seal and gasket formed as a unitary component.

15. A co-moulding for use in a metering chamber comprising at least a part of a valve body and a

seal formed as a unitary component.

16. A metering valve for assembly with a pressurised dispensing container, the valve comprising a valve stem co-axially slidable within a valve body defining a metering chamber, inner and outer seals for sealing between the valve body and the valve stem, and a gasket located on the valve body for sealing against a neck portion of a pressurised dispensing container, wherein the inner seal and gasket are formed as a unitary component.

17. A method of manufacturing a co-moulding for use in a metering valve comprising the steps of forming a first mould shape, injection moulding a first material to form a part of a valve body, forming a second mould shape containing the part of the valve body, and injection moulding a different material to form at least one sealing element in intimate relationship with the part of the valve body.

18. A method as claimed in claim 17 wherein the part of the valve body is formed as an inner member of a valve body and the at least one sealing element is formed as an inner seal.

19. A method as claimed in claim 17 wherein the part of the valve body is formed as an inner member and the at least one sealing element is formed as a unitary inner seal and gasket.

20. A method as claimed in claim 17 wherein the part of the valve body is formed as an outer member and the at least one sealing element is formed as an outer seal.

21. A metering valve substantially as hereinbefore described, with reference to, and as shown in the accompanying drawings.

Amendments to the claims have been filed as follows

Claims:

1. A metering valve for assembly with a pressurised dispensing container, the valve comprising a valve stem co-axially slidable within a valve body defining a metering chamber, inner and outer seals for sealing between the valve body and the valve stem, and a gasket located on the valve body for sealing against a neck portion of a pressurised dispensing container, wherein at least one of the inner seal, outer seal or gasket is formed as a co-moulding with at least a part of the valve body.

2. A metering valve as claimed in claim 1 wherein the valve body comprises inner and outer members.

3. A metering valve as claimed in claim 2 wherein the inner seal is formed as a co-moulding with the inner member.

4. A metering valve as claimed in claim 2 wherein the inner seal is formed as a co-moulding with the outer member.

5. A metering valve as claimed in either claim 3 or claim 4 wherein the outer seal is formed as a co-moulding with the outer member.

6. A metering valve as claimed in any of claims 2 to 5 wherein the gasket is formed as a co-moulding with the inner member.

7. A metering valve as claimed in any of claims 2, 3, 5 or 6 wherein the inner seal is formed as a co-moulding with the gasket and at least a part of the valve body.

8. A metering valve as claimed in claim 7 wherein the inner seal, gasket and inner member are formed as a co-moulding.

9. A metering valve as claimed in any of claims 2 to 8 wherein the inner member is a made of a first material and the inner seal and gasket are formed of a different material.

10. A metering valve as claimed in any of claims 2 to 9 wherein the outer member is a made of a first material and the outer seal is formed of a different material.

11. A metering valve as claimed in claim 9 or claim 10 wherein the first material is selected from acetal, nylon and polyester.

12. A metering valve as claimed in any of claims 9 to 11 wherein the different material is selected from polyurethane, thermoplastic vulcanizates, polystyrene polyethylenebutylene block copolymers, polystyrene polybutadiene block copolymers, thermoplastic polyolefin, co polyether ester, polyether block amides and polyethylene copolymers.

13. A co-moulding for use in a metering valve comprising at least a part of a valve body, inner seal and gasket formed as a co-moulding.

14. A co-moulding for use in a metering chamber comprising at least a part of a valve body and a seal formed as a co-moulding.

15. A method of manufacturing a co-moulding for use in a metering valve comprising the steps of

forming a first mould shape, injection moulding a first material to form a part of a valve body, forming a second mould shape containing the part of the valve body, and injection moulding a different material to form at least one sealing element in intimate relationship with the part of the valve body.

16. A method as claimed in claim 15 wherein the part of the valve body is formed as an inner member of a valve body and the at least one sealing element is formed as an inner seal.

17. A method as claimed in claim 15 wherein the part of the valve body is formed as an inner member and the at least one sealing element is formed as a unitary inner seal and gasket.

18. A method as claimed in claim 15 wherein the part of the valve body is formed as an outer member and the at least one sealing element is formed as an outer seal.

19. A metering valve substantially as hereinbefore described, with reference to, and as shown in the accompanying drawings.

INVESTOR IN PEOPLE

Application No: GB 0005481.7 **Examiner:** Emma Tonner
Claims searched: 1-15, 17-21 **Date of search:** 16 May 2000

Patents Act 1977
Search Report under Section 17

Databases searched:

UK Patent Office collections, including GB, EP, WO & US patent specifications, in:

UK Cl (Ed.R): B8N (NKB, NM): F1R (RCD): F2V (VR2)

Int Cl (Ed.7): B65D 83/14

Other: Online: EPODOC, PAJ, WPI

Documents considered to be relevant:

Category	Identity of document and relevant passage	Relevant to claims
X	GB 2 209 514 A (BESPAK PLC)	1, 13, 14, 15

X	Document indicating lack of novelty or inventive step	A	Document indicating technological background and/or state of the art.
Y	Document indicating lack of inventive step if combined with one or more other documents of same category.	P	Document published on or after the declared priority date but before the filing date of this invention.
&	Member of the same patent family	E	Patent document published on or after, but with priority date earlier than, the filing date of this application.